

Water quality in the tropics and subtropics: specifics, challenges and research needs

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United Nations University Institute for Environment and Human Security (UNU-EHS)

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While water quality is extensively studied in the temperate zone and in particular in Europe and North-America, much less information exists on the water quality in the tropics and subtropics as well as on resulting risk patterns. A transfer of knowledge from the temperate zones to the tropics - as frequently practiced - could prove difficult in many cases and might not be the most optimal solution. For example, thresholds at which eutrophication might occur vary among ecoregions. The risk posed by toxic algal blooms and cyanobacteria to aquatic life is likely higher in the tropics as seasonal changes in temperature in tropical aquatic environments are often not large enough to significantly influence (reduce) the population. Also, the growth rates of cyanobacteria often peak above 25°C which favors algal blooms in tropical regions compared to many temperate regions. In many tropical aquatic ecosystems, dissolved oxygen (DO) content is low but the effects of low DO on the fauna may be less severe in the tropics, since there are many species which have evolved breathing organs that extract oxygen from the air. Similarly, pathogen occurrence is often higher in tropical water and coincides with higher human exposure e.g. via the frequent use of surface water for domestic and drinking purposes. All these differences in pollution and exposure patterns have major implications for risk. These differences are known but seldom accounted for explicitly – mainly due to limitations in data and resources. For example, The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000 Guidelines) state that “there is insufficient information available at present about the aquatic ecology of tropical and temperate ecosystems in Australia and New Zealand to make such subdivision [e.g. tropical vs. temperate] meaningful”. The ANZECC guidelines still provide some default low-risk guideline trigger values for different ecosystem types for physical and chemical stressors – among others for tropical Australia while they also recognize that these default trigger values should only be used until site- or ecosystem-specific values can be generated. In developing nations of the tropics, one of the key challenges remains how to reconcile conflicting objectives such as economic and social development and requirements of freshwater and near-shore ecosystems.

The session aims to raise awareness for the specific needs and challenges of (sub)tropical regions in terms of water quality assessments, risk assessments and respective guideline development and to identify important steps in terms of future research needs. Participants will discuss the implications of global environmental change on (sub)tropical social-ecological systems and resulting pressures in ecosystems. Input presentations will set the scene on the specific situation of water quality in the tropics regarding data availability, water quality status, availability of climate-sensitive guidelines, and differences in risk for aquatic ecosystems. While discussing the implications for the social-ecological systems in place as well as the challenges and needs for responsive guideline development, the participants will identify knowledge gaps and specific research and implementation needs for the future in the format of a moderated discussion.

Following input presentations will set the stage:

1. Prof Dr Joseph M. Alcamo, Center for Environmental Systems Research, University Kassel
Most pressing water quality issues specifically in the (sub)tropical context – What are the knowledge gaps?
2. Dr Zita Sebesvari – United Nations University, Institute for Environment and Human Security
Do we understand the risk posed by water pollution on tropical aquatic ecosystems? What are the research gaps?
3. Prof Dr Jan Lentvaar, UNESCO-IHE Institute for Water Education, Delft, Netherlands
The tropics and their specifics in existing guidelines – Are existing guidelines adequate for tropical regions?

In the following moderated discussion, participants and speakers will debate on the most pressing needs in terms of water quality: 1) research, 2) implementation and 3) guideline development for the tropics in terms of chemical and biological water quality:

Are there substances to prioritize?

Are emerging pollutants a major issue in the tropics and if yes which ones?

How can science contribute to the development of adapted water quality guides for tropical regions?

In the absence of sufficient knowledge and data how do we address risks? Do we use the best possible approaches currently?